

R E M A R K S

The Examiner is respectfully requested to return a copy of the Form PTO/SB/08A filed on February 28, 2002 and to indicate thereon that the cited publications were considered and made of record.

As discussed at the top of page 2 of the Office Action, there was no original claim 50, so that the Examiner renumbered claims 51 to 70 as claims 50 to 69, respectively, for which the Examiner is thanked.

The above claim amendments serve to correct the dependency of claims necessitated by such renumbering of claims. Enclosed is a MARKED-UP VERSION OF THE AMENDMENTS TO THE CLAIMS.

The Abstract of the Disclosure was amended hereinabove. Enclosed is a MARKED-UP VERSION OF THE AMENDMENTS TO THE ABSTRACT.

Restriction was required under 35 USC 121 as follows:

Group I. Claims 1 to 31, 35 to 43, 45, 46, 48, 52 to 60 and 69, drawn to a method; and

Group II. Claims 32, 44, 47, 49 to 51 and 61 to 68, drawn to an apparatus.

Claims 33 and 34 should have been included in Group II.

Applicants elect Group I (claims 1 to 31, 35 to 43, 45, 46, 48, 52 to 60 and 69), with traverse.

All the method claims are directed to a method for metal smelting. All the apparatus claims are directed to an apparatus for metal smelting. Thus all the claims concern metal smelting. Therefore it is respectfully requested that the Restriction Requirement be withdrawn and that all the claims be examined.

If Group I were to be elected, applicants were required to elect one of the following species:

Species I as evidenced by claim 1.

Species II as evidenced by claims 2 to 29.

Species III as evidenced by claims 30 and 31.

Species IV as evidenced by claims 35 and 36.

Species V as evidenced by claims 37 to 41.

Species VI as evidenced by claims 42 and 43.

Species VII as evidenced by claims 45 and 69.

Species VIII as evidenced by claim 46.

Species IX as evidenced by claim 48.

Species X as evidenced by claim 52.

Species XI as evidenced by claims 53 to 55.

Species XII as evidenced by claims 56 to 59.

Species XIII as evidenced by claim 60.

Applicants elect Species I.

As discussed in the paragraph bridging pages 4 and 5 of the Office Action, if claim 1 is allowed, consideration and examination are requested for the other species.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

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Encs.: (1) PETITION FOR EXTENSION  
(2) MARKED-UP VERSION OF THE AMENDMENTS TO THE CLAIMS  
(3) MARKED-UP VERSION OF THE AMENDMENTS TO THE ABSTRACT



MARKE D-UP VERSION OF THE AMENDMENTS TO THE CLAIMS

50. (Amended) The apparatus for metal smelting of claim [50] 49, wherein the means to rotate and/or transfer the mixture of raw materials against the hearth of the prereduction furnace is a screw unit that can vary the rotational speed of screw shaft.

54. (Amended) The method for metal smelting of claim [54] 53, wherein the gas generated in the melting furnace is supplied to the tubular flame burner of the prereduction furnace after removing dust therefrom.

55. (Amended) The method for metal smelting of claim [54] and] 53 or claim [55] 54, wherein the gas generated in the melting furnace is stored in a gas holder, and is supplied from the gas holder to the tubular flame burner of the prereduction furnace.

57. (Amended) The method for metal smelting of claim [57] 56, wherein the prereduction furnace is divided into (i) a preheating and drying zone and (ii) a heating and reducing zone beginning from the raw material charge section side[,] ; and the mixture of raw materials is preheated and dried in the preheating and drying zone, then is heated and reduced in the heating and reducing zone.

58. (Amended) The method for metal smelting of claim [58] 57, wherein the preheating gas is a gas generated in the melting furnace, a gas discharged from the heating and reducing zone of the prereduction furnace, or a oxygen-containing support gas which was preheated by the sensible heat of one or more of [these] said gases.

59. (Amended) The method for metal smelting of claim [57] 56 or claim [58] 57, wherein the temperature of the preheating gas is in a range of from 100 to 400°C.

62. (Amended) The apparatus for metal smelting of claim [62] 61 comprising one unit of melting furnace and two units of prereduction furnace, the container hoisting positions of the two prereduction furnace [side] sides being located at opposite sides [thereof] therein to the raw material receiving hopper at the melting furnace side or to the raw material receiving hopper group.

63. (Amended) The apparatus for metal smelting of claim [62] 61, wherein the container hoist positioned at the prereduction furnace side [are] is a pair to each prereduction furnace.

64. (Amended) The apparatus for metal smelting of claim [62] 61, further comprising a turntable that can place a plurality of containers thereon and by which the plurality of containers can be successively moved to the raw material discharge opening position of the prereduction furnace and to the container hoisting position by the rotation of the turntable.

65. (Amended) The apparatus for metal smelting of claim [62] 61, wherein the melting furnace is a metal-bath type melt-reduction furnace.

66. (Amended) The apparatus for metal smelting of claim [62] 61, further comprising a driving mechanism of the hoist for hoisting the container, the driving mechanism comprising:

sheaves ( $Sa_1$ ) and ( $Sa_2$ ) being located at respective longitudinal ends of the track of the hoist;

a sheave ( $Sb$ ) being located on the hoist;

a container suspension means being suspended from the hoist in ascending and descending mode;

a sheave ( $Sc$ ) being mounted to the container suspension means in ascending and descending mode;

a wire-winding drum ( $Da$ ) for hoisting a container located below the track of the hoist;

a wire rope ( $Wa$ ) for hoisting container, which wire rope is unwound from the wire-winding drum ( $Da$ ) and is guided to each

sheave, the front end thereof being fixed to an end of the track; wherein the wire rope (Wa) guided from the sheave (Sa<sub>1</sub>) or (Sa<sub>2</sub>) is successively guided through the sheave (Sb) on the hoist, the sheave (Sc) on the container suspension means, and the sheave (Sb) on the hoist, then is guided to the sheave [(Sa<sub>2</sub>) (Sa<sub>2</sub>) or [(Sa<sub>1</sub>) (Sa<sub>1</sub>)], thus the container suspension means is suspended by the wire rope (Wa), and the winding and unwinding action of wire rope (Wa) by the wire-winding drum (Da) makes possible to ascend and descend the container suspension means.

67. (Amended) The apparatus for metal smelting of claim [67] 66, further comprising:

a wire-winding drum (Db) for counter weight use, mounted coaxially with the wire-winding drum (Da);

a wire rope (Wb) which is wound in reverse direction to the winding direction of wire rope (Wa) on the wire-winding drum (Da) and which is guided by a sheave located at upper position than the wire-winding drum (Db); and

a counter weight (Co) attached to the front end of the wire rope (Wb) .

68. (Amended) The apparatus for metal smelting of claim [68] 67, wherein there are located each pair of the sheaves (Sa<sub>1</sub>) and (Sa<sub>2</sub>) positioned at respective longitudinal ends of the track of the hoist, the sheave (Sc) mounted to the container suspension

means, the wire-winding drum (Da) for hoisting container, the wire-winding drum (Db) for counter weight use, the wire rope (Wa) for hoisting container, the wire rope (Wb) being wound by the wire-winding drum (Db), and the counter weight (Co) attached to the front end of the wire rope (Wb) .

**MARKED-UP VERSION OF THE AMENDMENTS TO THE ABSTRACT**



ABSTRACT OF THE DISCLOSURE

[The invention provides a] A method for manufacturing molten metal at a low cost, a favorable energy balance and high productivity by melt-reducing a metal oxide and/or a metal hydroxide such as iron ore. [To do this, at] In the method, at least the metal oxide and/or the metal hydroxide, such as iron ore, is preliminarily mixed, or preliminarily mixed and granulated, or preliminarily mixed and molded, with a carbonaceous material to prepare a mixture of raw materials. The mixture of raw materials is preliminarily reduced in a prereduction furnace [of], such as a rotary hearth [type,] or a rotary kiln [type, or the like] to attain an average metallization degree of the metal oxide and/or the metal hydroxide from 5 to 55% [, which]. The mixture is then charged to a melting furnace for metal smelting, [where] wherein the mixture of the raw materials is melted and finally reduced using the carbonaceous material as the reducing agent and using the combustion heat of the carbonaceous material and of carbon monoxide generated in the furnace as the major heat source. [Through the process, molten metal such as molten iron is manufactured assuring favorable energy balance and high productivity.]